

GENETICISTS FIND EVOLUTION CLUES

Invalidation of Old Concepts
May Lead to Recreating
Progenitor of Man

By WILLIAM L. LAURENCE

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CHICAGO, Dec. 30 — Experiments in genetics invalidating many of its present basic concepts and promising to lead to revolutionary developments in the breeding of new species of plants and animals, as well as of human beings, were described here today at the annual meeting of the American Association for the Advancement of Science. The new findings may also make possible eventually to re-create species long extinct, including the progenitor of man.

The experiments, reported before the meeting of the Genetics Society of America, were carried out by a team of scientists at the University of Wisconsin headed by Prof. C. Leonard Huskins of the Botany Department. His report today was presented jointly with Drs. Lotti M. Steinitz, R. E. Duncan and Rhona Leonard.

The bodies of plants and animals are composed of two types of cells, somatic cells (the non-sexual cells constituting the body) and germ cells, namely the cells by which the species reproduce themselves.

Germ Cells Are Divided

Each cell, according to the accepted genetic concepts, contains a specific number of chromosomes, rod-like bodies that carry the genes, the agents transmitting hereditary characteristics from generation to generation. The somatic, as well as the germ cells of each species, geneticists have agreed, all contain a fixed number of chromosomes, the number being specific for each species of plant or animal, or even insects and other lower forms of life. For example, the somatic cells of man are all supposed to contain forty-eight chromosomes, while man's germ cells at the time of fertilization contain half that number, the germ cells of the male and female combining to form one whole cell of forty-eight, each parent contributing one-half of the offspring's hereditary make-up.

When the two halves of the germ cells combine to form a complete cell the chromosomes of the two halves are said to pair, that is, the chromosomes of the male and the female join to form one whole cell. In other words, in case of the human species, the half cell of the male's sperm and the half cell of the female's ovum, each containing twenty-four chromosomes, are paired to form a whole germ cell of forty-eight chromosomes, containing half the hereditary characteristics of the father and half of the mother.

It is some of these concepts that the investigations at the University of Wisconsin have shown not to be universally true.

The Wisconsin geneticists used in their studies the non-sexual cells of the root-tips of chromosomes of a plant known as rhoeo, sometimes called "Moses in the Bull-rushes." With these as their "guinea pigs," they proceeded to find about, by means of a chemical derived from living cells, known as sodium ribonucleate, evolutionary changes in the roots, plants regarded as genetically immutable.

Sodium ribonucleate belongs to the vital group of chemicals known as nucleic acids, present in different forms in both the nucleus (yolk) and outer protoplasmic envelope (cytoplasm) of all living cells. These nucleic acids have previously been shown by biochemists to be present at the time of natural chromosome pairing, which is the basic process in the formation of germ cells.

Sexual Divisions in Roots

Until now it has been regarded as axiomatic that sexual divisions can take place only in germ cells. The Wisconsin workers, however, discovered that sexual divisions can also be induced in the roots of plants, namely, somatic (non-sexual) cells, by treatment with nucleic acids.

"This gives us an idea," Dr. Huskins said, "of how chemical modifications may have been active in the evolution of sex."

"Some modern species of plants, such as strawberries and oats, which are known to have been produced by hybridization, followed by the doubling of the number of their chromosomes, occasionally throw reversions to ancestral types. Sexual divisions such as we have produced in non-sexual tissues can account for this reversion if they later become involved in normal sex division. A possibility is thus opened for the experimental recovery of the ancestral forms of many such species of plants."

"Furthermore, pairing of chromosomes such as is believed to take place only in the formation of germ cells, and high nucleic acid content, have many times been reported in tumors. The present work may help us to understand the significance of their relationship."

"For many years," Dr. Huskins continued, "it has been thought that all the cells of a plant or animal body contain the same number of chromosomes. By using hormones to make cells that have ceased multiplication go through another division, and in so doing reveal their chromosomes, we have found that numerous cells of the plant have many times the original number of chromosomes."

"Other workers have shown this to be true in insects. It is suspected but not yet fully established in other animals and also in man."

"We have also shown that the chromosomes may be very much more subdivided than is provided for by the usual theory of gene and chromosome relationship."

"From these facts we support the idea that the genes are like protein molecules made up of many layers, and we add the theory that they act physiologically by reproducing themselves throughout the life of the plant or animal cell, instead of dividing only when a cell divides, as was formerly thought."

Evolution Turned Backward

Thus the Wisconsin studies have led to two discoveries, both of which have revolutionary implications for the future control by man of his own evolution as well as that

of plants and animals; at the same time offering the possibility to turn evolution backward and re-create the original species of plants and animals as well as man's own image of the dim prehistoric past, when he was still struggling upward from his ape ancestors.

Discovery number one was summarized by Dr. Huskins as follows: "It is now clear that all cells of the plant or animal body do not contain the same number of chromosomes and genes, as taught in all biology text-books. Chromosomes, the bodies that carry the genes, are multiple structures, much more subdivided than is taught in all text-books and assumed by most geneticists."

Discovery number two: "Meiosis, namely chromosome pairing and sexual type divisions, such as ordinarily occur only in the male or female germ cells to produce the halved number of chromosomes, has been induced in root-tips (i.e., non-sexual) cells by solutions of nucleic acid, specifically, sodium ribonucleate."

"Chromosome pairing and high nucleic acid content have often been reported in tumors, so our discovery No. 2 may make this more understandable."

"We can now explain how ancestral species have come out of modern strawberries and oats, and expect to be able to abstract ancestral types from many kinds of plants."

"Our discovery of multiple chromosome numbers in body cells and the multiplicity of strands in a chromosome, cause us to consider the gene as made up of many layers, like a protein (hemoglobin) molecule, which can shed layers and so cause development and growth effects or can divide into two bundles of layers, as it must do in hereditary transmission. The gene of hereditary transmission is therefore a multiple of the gene or physiology and development."

"In addition, four steps by which sex probably first arose in primitive organisms are now known and can be produced experimentally."

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